

Claims

1. A device for use in a cartridge (9) for preparing a liquid solution for a medical procedure, said device comprising a hollow body (24) defined by a wall (50) enclosing a cavity of the body, the body having a first end (52) and a second end (53), and being provided with a least one slit-shaped opening (55) extending through the wall, said first end being open and adapted for receiving liquid to be introduced into the cartridge (9), which liquid leaves the device through said slit-shaped opening (55) in a flow direction (b), wherein said slit-shaped opening has a first extension (61) and a second extension (62) being substantially perpendicular to the flow direction (b) and to the first extension (61), wherein the second extension (62) is significantly shorter than the first extension (61).

2. A device according to claim 1, wherein said hollow body (24) has a centre axis (x) and an elongated, tubular shape along the centre axis.

3. A device according to any one of claims 1 and 2, wherein said hollow body (24) is tapering along the centre axis (x) towards the second end (53).

4. A device according to any one of the preceding claims, wherein said hollow body (24) at the first end (52) has engaging means (73, 74) adapted for connection of the device to the cartridge (9).

5. A device according to any one of the preceding claims, wherein the second extension (62) is significantly shorter than the length (63) of the slit-shaped opening (55) in the flow direction (b).

6. A device according to any one of the preceding claims, wherein the first extension (61) is substantially perpendicular to the flow direction (b).

7. A device according to any one of the preceding claims, wherein the second extension (62) is equal to or less than 0,1 mm.

5 8. A device according to any one of the preceding claims, wherein the second extension (62) is equal to or less than 0,08 mm.

9. A device according to any one of the preceding claims, wherein the second extension (62) is equal to or more than 0,02 mm.

10 10. A device according to any one of the preceding claims, wherein the second extension (62) is equal to or more than 0,04 mm.

15 11. A device according to any one of the preceding claims, wherein the second extension (62) is approximately 0,06 mm.

20 12. A device according to any one of the preceding claims, wherein the device includes a plurality of slit-shaped openings (55), which extend through the wall (50).

13. A device according to claim 12, wherein said slit-shaped openings (55) are distributed around the wall (50).

25 14. A device according to any one of the preceding claims, wherein said hollow body (24) has a wall portion (81-84) at least in the proximity of the second end (53), and wherein said slit-shaped opening (55) extend through said wall portion (81-84).

30 15. A device according to claim 14, wherein said wall portion (82) has a tip-like shape.

16. A device according to claim 15, wherein said wall portion (82) is substantially conical.

35 17. A device according to claim 14, wherein said wall portion (83, 84) is substantially plane.

18. A device according to claim 17, wherein a normal direction of said wall portion (83) forms an angle of inclination to the centre axis (x).

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19. A device according to any one of the preceding claims, wherein the flow direction (b) forms an angle to the centre axis (x).

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20. A device according to claim 18, wherein the centre axis (x) extends substantially in parallel with a normal direction of the plane wall portion (84).

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21. A device according to any one of the preceding claims, wherein the slit-shaped opening (55) has an upstream end and a downstream end with respect to the flow direction (b), wherein the second extension of the slit-shaped opening increases in the flow direction (b) from a minimum value at the upstream end of the slit-shaped opening to a maximum value at the downstream end of the opening (55).

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22. A cartridge for preparing a liquid solution for a medical procedure and arranged to contain a particulate material (20), wherein the cartridge (9) includes:

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an inner space (10) for housing the particulate material (20);

an inlet (21) arranged to permit the introduction of a liquid into the inner space (10);

an outlet (22) arranged to permit the discharge of liquid from the inner space (10); and

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a device comprising a hollow body (24) defined by a wall (50) enclosing a cavity of the body, the body having a first end (52) and a second end (53), and being provided with a least one slit-shaped opening (55) extending through the wall, said first end being mounted to the cartridge (9) at the inlet in such a manner that the body (24) extends into the inner space (10) and said second end is

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located in the inner space of the cartridge, said first end being open and adapted for receiving said liquid to be introduced into the cartridge, which liquid leaves the device through said slit-shaped

opening (55) in a flow direction (b), wherein said slit-shaped opening has a first extension (61) and a second extension (62) being substantially perpendicular to the flow direction (b) and to the first extension (61), wherein the second extension (62) is
5 significantly shorter than the first extension (61).

23. A cartridge for preparing a liquid solution for a medical procedure and arranged to contain a particulate material, wherein the cartridge (9) includes:

- 10 an inner space (10) for housing the particulate material;
an inlet (21) arranged to permit the introduction of a liquid into the inner space;
an outlet (22) arranged to permit the discharge of liquid from the inner space; and
- 15 a device according to any one of claims 2 to 21, wherein the first end (52) is mounted to the cartridge (9) at the inlet in such a manner that the body extends into the inner space and said second end is located in the inner space.

20 24. A cartridge according to any one of claims 22 and 23, wherein the cartridge (9) includes filter (23) arranged at the outlet (22) and to permit passage of the liquid through the filter (23), but to prevent passage of the particulate material through the filter, wherein the filter permits the liquid to pass through the filter in a filter direction
25 (a).

25. A cartridge according to claim 24, wherein the filter (23) includes at least one slit-shaped opening (30), which has a first extension (31) and a second extension (32) being substantially
30 perpendicular to the filter direction (a) and to the first extension, wherein the second extension is significantly shorter than the first extension.

26. A use of a device in a cartridge (9) for preparing a liquid
35 solution for a medical procedure and arranged to contain a particulate material (20), wherein the cartridge includes:
an inner space (10) for housing the particulate material;

an inlet (21) arranged to permit the introduction of a liquid into the inner space;

an outlet (22) arranged to permit the discharge of liquid from the inner space; and

- 5 said device comprising a hollow body (24) defined by a wall (50) enclosing a cavity of the body, the body having a first end (52) and a second end (53), and being provided with a least one slit-shaped opening (55) extending through the wall, said first end being mounted to the cartridge (9) at the inlet (21) in such a manner that
- 10 the body extends into the inner space (10) and said second end (53) is located in the inner space of the cartridge, said first end being open and adapted for receiving said liquid to be introduced into the cartridge (9), which liquid leaves the device through said slit-shaped opening (55) in a flow direction (b), wherein said slit-shaped opening has a first extension (61) and a second extension (62) being substantially perpendicular to the flow direction (b) and to the first extension, wherein the second extension (62) is significantly shorter than the first extension (61),
- 15 the use including the step of supplying said liquid to the cartridge (9) via the inlet (21) in such a way that the liquid passes through the particulate material (20) and thereby dissolves at least a part of the particulate material to form a liquid solution.
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27. A use according to claim 26, wherein the liquid is a dialysis liquid.
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28. A use according to any one of claims 26 and 27, wherein the particulate material includes bicarbonate and/or sodium chloride.

- 30 29. A use according to any one of claims 26 to 28, wherein the device includes the features of any one of claims 2 to 21.

30. A system for preparing a liquid solution for a medical procedure, the system including:

- 35 a cartridge (9) containing a particulate material in an inner space thereof and including an inlet and an outlet;

a first liquid (3) conduit having a first end (4) communicating with a source (1) of liquid to withdraw the liquid into the first liquid conduit and a second end;

a second liquid conduit (6) having a first end (7) communicating with a source (1) of liquid and a second end (8) communicating with the inlet of the cartridge (9) for introducing the liquid into the inner space (10) to produce a concentrate liquid solution containing at least a part of the particulate material dissolved in the liquid;

a third liquid conduit (11) communicating with the outlet of the cartridge and with a mixing point (13) in the first liquid conduit (3) intermediate said first and second ends (4, 5) for conducting said concentrate liquid solution from the cartridge (9) into said first liquid conduit to be mixed with the liquid being conducted through the first liquid conduit to thereby produce said liquid solution in the first liquid conduit for delivery to said second end of the first liquid conduit; and

a device comprising a hollow body (24) defined by a wall (50) enclosing a cavity of the body, the body having a first end (52) and a second end (53), and being provided with a least one slit-shaped opening (55) extending through the wall, said first end being mounted to the cartridge (9) at the inlet in such a manner that the body extends into the inner space (10) and said second end (53) is located in the inner space of the cartridge, said first end being open and adapted for receiving said liquid to be introduced into the cartridge, which liquid leaves the device through said slit-shaped opening (55) in a flow direction (b), wherein said slit-shaped opening has a first extension (61) and a second extension (62) being substantially perpendicular to the flow direction (b) and to the first extension (61), wherein the second extension (62) is significantly shorter than the first extension (61).

31. A system according to claim 31, wherein the device includes the features of any one of claims 2 to 21.

32. A system according to any one of claims 31 and 32, wherein the cartridge (9) includes filter (23) arranged at the outlet (22) and to permit passage of the liquid through the filter (23), but to prevent

passage of the particulate material through the filter, wherein the filter permits the liquid to pass through the filter in a filter direction (a).

- 5 33. A system according to claim 33, wherein the filter includes at least one slit-shaped opening (30), which has a first extension (31) and a second extension (32) being substantially perpendicular to the filter direction (a) and to the first extension, wherein the second (32) extension is significantly shorter than the first extension (31).
- 10 34. A system according to any one of claims 31 and 34, wherein the liquid is a dialysis liquid.
- 15 35. A system according to any one of claims 31 to 35, wherein the particulate material includes bicarbonate and/or sodium chloride.